

PHYSIOTHERAPY IN DISEASES OF THE SKIN.

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Of the three main methods used in the treatment of diseases of the skin, external applications, internal treatment, and physiotherapy, there can be no doubt that far greater advances have taken place in the latter than in either of the two former groups, during the past quarter of a century. It is indeed true to say that dermatological treatment has been revolutionized and the prognosis of certain diseases completely changed, by the introduction of new physical therapeutic methods.

I propose to describe in this paper the more important methods employed at the present time, to discuss the indications for their use, and to show what results can be expected of them.

X-rays and Radium.

The discovery of X-rays in 1895 was rapidly followed by their employment as a therapeutic agent, and by the beginning of the century many diseases were being treated. As is usual with any important new method of treatment, at the beginning hopes ran high and it was believed that the cure of cancer and even of pulmonary tuberculosis was in sight. The disappointment which followed the discovery that these hopes were not justified led to a period of pessimism, which was finally followed by a realization of the true value of this important weapon in the therapeutic armamentarium.

In the early days estimation of dosage presented many difficulties and the introduction of the skin unit and the pastille radiometer by Sabouraud & Noiré in 1904 was a great advance. The skin unit is the amount of the X-rays required to cause a temporary fall of scalp hair without producing an erythema. This dose will usually produce an erythema on other parts of the body. This amount of the X-rays will also change the colour of a pastille of barium platinocyanide placed half-way between the anode and the skin, from a green colour known as Tint A to an orange colour known as Tint B; the skin unit is therefore frequently referred to as 1 B. Other more exact radiometers for use with pastilles have since been devised.

It is now possible to calibrate X-ray apparatus; by keeping the distance of the skin from the anode, the voltage and the amperage constant, a direct relationship between the time of exposure and the dose is established. In minute doses X-rays stimulate cell function, while in moderate doses ($\frac{1}{4}$ – $\frac{3}{4}$ B) they inhibit cell division especially in young, undifferentiated and very active cells, diminish the secretions of the sweat and sebaceous glands and have an anæsthetic action on the nerve endings. It is also believed that they alter the skin in such a way that bacteria and fungi find it a less favourable medium on which to grow. In slightly larger doses (1 B) they cause a temporary loss of hair, while in very large doses (2–6 B) they lead to destruction of the tissues.

X-rays are useful in conditions in which it is desirable temporarily to remove hair, when it is desired to reduce activity of the sebaceous and sweat glands, in

certain bacterial and fungus infections, in certain inflammatory diseases, e.g. **eczema**, **lichen planus**, etc., when beneficial effects may be expected as a result of inhibition of cell division and activity, and in cases of localized **pruritis** in which they are used for their antipruritic effects.

X-rays are used in large doses for the destruction of malignant new growths, especially **rodent ulcers**.

In sub-acute and chronic cases of **eczema** brilliant results may be obtained; patches which have existed for months often disappear completely after one or two treatments. It is usual in these cases to give fractional doses ($\frac{1}{2}$ - $\frac{1}{3}$ B) at intervals of a week or a fortnight. It is of course essential to find and treat the cause of the **eczema** in order to prevent recurrences.

X-rays are rarely used in **psoriasis** although they will cause a prompt disappearance of the patches. Recurrences are so common that there is a risk that the patient may seek X-ray treatment elsewhere in subsequent attacks and in this way receive excessive dosage of the rays. They may however occasionally be used in very stubborn patches on the elbows, knees or sacrum and in resistant cases of **psoriasis** of the scalp.

In **lichen planus**, the treatment is especially used in the hypertrophic lesions, which are not readily curable by other means.

X-ray treatment is extremely valuable in certain diseases due to infection with bacteria. It is the best local measure for the treatment of **acne**, a few fractional doses often being enough to clear up the condition. In this disease my usual practice is to give 6-8 doses of $\frac{1}{4}$ B at weekly intervals. This dosage, which is on the low side, is quite insufficient to lead to any subsequent atrophic changes. Inhibition of cell division, reduction of sebaceous secretion and possibly a direct or indirect action on bacteria are the probable modes of action in this disease.

X-rays are also valuable in **sycosis**; fractional doses often give very satisfactory results but it is sometimes necessary to produce a temporary epilation. Permanent epilation should never be undertaken without very careful consideration, for in order to obtain it a certain degree of radio dermatitis must be produced. For the same reason X-rays should not be used in cases of **hypertrichosis**.

Fractional doses of X-rays are also often of value in cases of infective **paronychia**.

In the case of **ring-worm** infection of the scalp it is necessary to produce temporary epilation in order to cure the disease. Most careful technique is required as the margin is narrow; if too small a dose is given defluvium will not take place, if too large a dose is given permanent alopecia will be the result.

It has already been stated that X-rays have an anti-pruritic action and they are therefore particularly useful in cases of **pruritis ani** and **pruritis vulvæ**. In many cases no local causes can be found to account for these conditions and in such cases a few fractional doses of X-rays will relieve the irritation, break the vicious circle of scratching-itching-scratching, and allow the affected parts to return to a normal state.

Patches of **neuro-dermatitis** which are often found on the neck and on the inner sides of the thighs in women usually respond well to X-ray treatment. The rays have an anæsthetic action on the nerve endings, thus diminishing irritation and leading to a cessation of scratching; they also lead to a disappearance of the patches which have been produced. X-ray treatment is often the method of choice in cases of **hyperidrosis**. In all these conditions fractional doses are used as in the treatment of **acne**.

Plantar warts, common warts and senile keratoses all respond well to X-rays; a dose of $1\frac{1}{4}$ B should be given, the normal skin being protected by means of lead. The dose should not be repeated for at least six weeks, but in the majority of cases one dose is sufficient to cure the condition.

Other diseases for which X-rays are commonly used with good results are **mycosis fungoides, granuloma annulare, keloid, sarcoid and tuberculosis verrucosa cutis**. Finally X-rays may be used for their destructive action in malignant new growths, the best results being given in **basal-celled epithelioma or rodent ulcer**. The lesion should be thoroughly curetted, the normal surrounding tissue protected by means of lead and a dose of 4-6 B given. This method of treatment for rodent ulcers has, however, to a great extent been replaced by radium treatment which gives a better cosmetic result with less discomfort to the patient. Squamous-celled epitheliomata should be treated either with radium or excision.

Radium.

Radium is also the method of choice in the treatment of superficial **cavernous and strawberry-mark angiomas**. It is of less value in port wine stains probably because in this condition the vessels are fully formed at birth, while in the former lesions the cells are less mature and therefore more radiosensitive. Radium is also used in the treatment of **keloid, soft corns, keratoses and leukoplakia**.

Ultra-violet Rays.

Although natural heliotherapy was practised in the earliest times by Egyptians, Greeks and Romans, this method of treatment fell into disuse in the Middle Ages and was not revived until the middle of the last Century. It was not, however, until 1893 that the artificial production of ultra-violet rays was employed in the treatment of disease, when Finsen of Copenhagen used the carbon arc lamp in the treatment of lupus.

Later the invention of the mercury vapour lamp led to a rapid development in this method of treatment. The main artificial sources of ultra-violet rays are:—

1. The carbon arc lamp.
2. The tungsten arc lamp.
3. Mercury vapour lamps
 - (a) air cooled;
 - (b) water cooled.

The most active ultra-violet rays are from 2,100-3,900 Angstrom units. The shorter waves have very little power of penetrating the skin, all rays less than 3,000 A.U. being absorbed by 1 mm. of skin. Power of penetration increases with the wave-length up to 11,000 A.U. (short infra-red rays) after which, in the infra-red region penetration diminishes with increasing wave-length. Ultra-violet rays

shorter than 3,200 A.U., especially from 2,500-2,970, produce erythema of the skin after a latent period of a few hours. This erythema is classified as:—

1st degree. A transient erythema.

2nd degree. Slight erythema with powdery desquamation.

3rd degree. Marked erythema with considerable peeling.

4th degree. Severe bullous reaction followed by desquamation. The erythema reaches its maximum intensity in 8-24 hours after which it subsides. Repeated exposure to ultra-violet rays produces pigmentation of the skin. Rays shorter than 3,020 A.U. lead to the synthesis of Vitamin D in the skin. The rays from 2,100-2,900 have a marked germicidal effect but can only penetrate 0.1 mm. of skin.

The exposure to ultra-violet rays increases the calcium, phosphorus, iron and iodine in the blood and increases the resistance of the body to infection.

In the treatment of skin diseases, ultra-violet light is used for its *general* effects in cases of chronic infection e.g. **furunculosis, tuberculosis of skin and glands, acne, and infected wounds** to raise the body resistance to the infecting organisms. For this purpose general light baths are given either with the carbon-arc or the air-cooled mercury vapour lamp.

Excellent results are obtained from general carbon arc baths in cases of **tuberculous adenitis**, the treatment being either given alone or in combination with surgical methods. If, however, the glands have broken down with the formation of a sinus and resulting scrofuloderma, local treatment should be given in addition to the general light baths. For this purpose I usually use either the tungsten arc lamp, or the Kromayer lamp with a suitable quartz applicator.

2nd-3rd-degree erythema doses of ultra-violet light are used for their peeling effects in the treatment of **psoriasis and acne**. I think, however, that the latter disease is usually better treated by means of X-rays. In extensive psoriasis it is an extremely good method of treatment for it can be repeated without any fear of subsequent skin injury. As I have already said, the frequent recurrences of this disease prevent one from treating it with X-rays in most cases, as there would be a risk of over-dosage.

The rays are also used *locally* in order to produce repeated erythema and tissue stimulation in cases of alopecia areata, a 3rd-degree erythema being produced at each treatment; for this purpose either the tungsten arc or the mercury vapour (air or water cooled) lamp is used. I have found that the best method of treatment in cases of **chilblains** is the production of a 2nd-degree erythema locally by means of the Kromayer lamp or the air-cooled mercury vapour lamp. I also find it an advantage to give general light baths at the same time.

In other diseases ultra-violet light is used in order to destroy diseased tissue. In **lupus vulgaris** good results are obtained by giving 4th-degree erythema doses with the Finsen-Lomholt or Kromayer lamp, the dosage being repeated when the previous reaction has subsided. General carbon arc baths should be given simultaneously. In **port-wine naevus** I have obtained very satisfactory results by giving repeated 4th-degree erythema doses with the Kromayer lamp. This condition responds badly to other forms of treatment and its successful treatment by light is a great therapeutic advance.

Heliotherapy is of course contra-indicated in diseases associated with light sensitisation such as lupus erythematosus; it should also be avoided in acute inflammatory diseases of the skin.

Carbon-Dioxide Snow.

Another physiotherapeutic method which has been introduced during the present century is the use of *carbon-dioxide snow* in the destruction of certain tumours and this method of treatment is commonly used in the treatment of **vascular naevi** of the strawberry mark type, **senile keratoses**, **common warts**, and small patches of **lupus erythematosus**. The liquid carbonic acid is kept in a metal cylinder and when the snow is required for use the gas is allowed to escape into a towel or leather bag; it is then moulded into the desired shape for application, the time of application and the degree of pressure depending on the lesion being treated and on its thickness. This method of treatment gives excellent results and only a thin white scar remains.

Galvano-Cautery.

The *galvano-cautery* is most useful in the treatment of large numbers of small **warts**; a drop of novocaine should be injected under the lesion and the cautery applied until charring of the wart takes place. Care must be taken not to injure the basal layer of the epidermis as it is quite possible to destroy the warts without leaving a scar. The cautery is also used in opening **acne pustules** and **boils**, although I do not think that it possesses any great advantages over the use of a fine sharply pointed knife for this purpose.

Electrolysis.

For the removal of **superfluous hairs** the best method of treatment is *electrolysis* using a fine iridioplatinum needle attached to the negative pole. The indifferent electrode may be either placed in a bowl of water or attached to a sponge-covered handle which is held by the patient. The needle is inserted into the mouth of the hair follicle and the patient completes the circuit by holding the electrode or by placing the hand in the basin of water. A current of $\frac{1}{2}$ -1 milli-ampere is allowed to flow for 30 seconds. When the hair has been destroyed bubbles will be noted at the mouth of the follicle and the hair can then be easily removed by forceps without offering any resistance. If the hair does not easily come away it means that it has not been completely destroyed, usually because the needle has not been accurately placed in the follicle.

This method of treatment requires a great deal of patience both on the part of the patient and the operator, and in extensive cases a very large number of treatments are required. It is, however, the only really satisfactory method for treatment of this condition, as the use of X-rays is condemned because of the almost inevitable production of some degree of radio-dermatitis at a later date. Other methods by the use of chemical depilatories, etc. are of course merely palliative.

Electrolysis is also a very valuable method for the destruction of small **moles**, particularly the soft moles often seen on the face. The method of treatment is to have platinum needles attached both to the positive and negative poles which are inserted into opposite sides of the mole and a current of 5 milliamperes then switched on. Experience is required to know when sufficient treatment has been

given. In skilful hands these moles may be destroyed with an almost imperceptible scar. The same method is sometimes used in the treatment of small **strawberry-mark nævi**, but I think that these lesions are better treated with radium or carbon-dioxide snow.

Ionization.

The galvanic current is also used in order to drive drugs into the skin by ionization. Magnesium ionization is used in cases of **warts** and sometimes gives extremely good results. The method is, however, rather uncertain, and it is difficult to know in any given case if it will be effective. The affected part is placed in a saturated solution of magnesium sulphate together with the positive pole, while a hand is placed in a bowl of saline containing the negative pole. The current is then switched on and gradually increased to the maximum which the patient can tolerate; it is then kept at this level for twenty minutes. Treatments are usually given twice a week. In favourable cases the wart turns a dark brown colour and falls off leaving no scar.

I have found atropine ionization of value in cases of localised **hyperidrosis** particularly when affecting the axillæ. A pad soaked in a 1:400 solution of atropine is placed over the positive pole and applied to the affected part while the negative electrode covered with a pad soaked in saline is placed on another part of the body. The treatment is then the same as magnesium ionization. Zinc ionization is used in the treatment of infected **ulcers**, the active electrode in this case also being the anode.

Galvanic baths are used with good effect in the treatment of **chilblains** and other diseases associated with circulatory disturbances of the limbs.

Diathermy.

At the present time surgical diathermy is very largely used in the destruction of **skin tumours**. When these tumours are small the monopolar method is used, but large lesions require the bi-polar method which is more commonly used for coagulation. An anæsthetic either local or general is usually required with the bi-polar method. Good results have been obtained with this method in the treatment of **nævo-carcinomata**, **keratoses**, **warts**, etc.

It is thus seen that we have at our disposal a variety of methods of treatment, the main indications for which I have attempted to give in this paper. In some cases the choice may lie between two or more of these methods; in such cases experience is necessary in order to make the right selection.